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## A TAXONOMIC STUDY OF SETARIA ITALICA AND ITS IMMEDIATE ALLIES

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This paper deals with those species of *Setaria* grouped by Ascherson and Graebner, Syn. Mitteleur. Fl. 2<sup>1</sup>: 74 (1899) under their super-species *Panicum viride* (that is *S. verticillata*, *S. viridis* including *S. ambigua* and *S. italica*) and joined by Kuntze, Rev. Gen. 2: 767, 768 (1891) to form his *Chamaeraphis italica*. The study was undertaken with a view to determine what *S. italica* var. *germanica* really was, as material of various forms was passing under that name and it gradually involved a careful examination of the whole group,—especially of *S. viridis* and *S. italica* since the old line of separation of these species did not hold good. *S. verticillata* separated itself readily when confined to those specimens with retrorsely barbed setae.

Some recent authors have reduced *S. italica* to a variety or sub-species of *S. viridis*,—for example Ascherson and Graebner, Syn. Mitteleur. Fl. 2<sup>1</sup>: 77 (1899), as *Panicum viride* B. *P. italicum* and Briquet, Prodr. Fl. Corse 1: 68 (1910), as *Setaria viridis* subsp. *italica*. This is readily understandable when we consider that length of panicle and size of spikelet, the key characters commonly employed to separate the two species, entirely fail to do so as these characters frequently overlap very strongly, though they hold good in the average specimens. Generally, the panicle of *S. viridis* is said to range up to 8.5 cm. in length while the length of spikelet is given as about 2 mm. Careful study of the material at hand with measurements of every specimen examined, shows a range of panicle dimensions from 1 to 15 cm. long by 4 to 14 mm. in diameter. The spikelets range from 1.8 to 2.7, commonly 2.2 to 2.5 mm. long. *S. italica*, on the other hand, is said to have a panicle from 10 to 20 cm. long and spikelets about 3 mm. long. My measurements show that in the denser, more spike-like forms,—grouped by Alefeld, Landw. Fl. 315 (1866), in his Sect. *Moharium* and best represented by subvar. *germanica* of this paper,—the panicle may be as short as 1 cm. and not more than 7 mm. in diameter while the spikelets of the whole species vary in length from 2 to 3.2, more commonly 2.6 to 3 mm.

In testing the stability of the various characters I found that ordinarily the second glume of *S. viridis* equaled the sterile lemma in length whereas in *S. italica* it was for the most part noticeably shorter. Furthermore the spikelets in *S. viridis*, as soon as they become at all mature, shell out the whole spikelet—quite readily—leaving a cup-like receptacle; whereas those of *S. italica* shell out the fruit<sup>1</sup> only leaving the first and second glume and sterile lemma behind. This appears to me to be a good specific character and the use of it as a key character in separating the specimens gave homogeneous groups.

The name *germanica* was first used by C. Bauhin, *Theatr. Bot.* 518, fig. (1658) as *Panicum Germanicum sive panicula minore*. Exactly what form of *S. italica* Bauhin had is impossible to state though he undoubtedly had one of the larger lobulate forms as he states that the panicle is nine inches rarely a foot long. It may be yellow, purple or black, but he fails to say anything about the length of the setae. The plate is rather indefinite, but represents panicles with short setae. While the name originated with Bauhin the first use of it after 1753 is *Panicum germanicum* Miller, *Gard. Dict.*, ed. 8, no. 1 (1768). Miller describes the species as follows "Spica simplici cernua, setis brevioribus, pedunculo hirsuto," basing his name on C. Bauhin, *Pinax* 27 (1671). In the discussion of his species of *Panicum* he makes the following statements regarding *P. germanicum*, "The stalks are terminated by compact spikes, which are about the thickness of a man's finger at their base, growing taper toward their points, and are eight or nine inches long,<sup>2</sup> . . ." The phrase "setis brevioribus" has undoubtedly led to the recent interpretation of *S. italica* var. *germanica* as a form with setae shorter than the spikelets, but does this phrase compare the length of the setae with the spikelets; why may it not be a term comparative with the following species, *Panicum italicum*, which according to Bauhin's plate in *Theatr. Bot.* 519 is a plant with long setae? I believe that this interpretation is correct as I have a photograph and spikelets of the Miller material in the British Museum which were kindly sent me by Mr. A. B. Rendle. This material was collected in Chelsea Garden in 1760 and is labeled "*Panicum Germanicum sive panicula minore*" and consists of a panicle and two leaves. As a centimeter scale has been placed on the

<sup>1</sup> The term *fruit* is consistently used in this paper to mean the seed inclosed in the fertile lemma and palea.

<sup>2</sup> These measurements are too long for subvar. *germanica* and also do not agree with Miller's specimen.

sheet the measurements can be easily obtained. The leaves are respectively 30 cm. long by 14 mm. broad and 24 cm. long by 14 mm. broad; the panicle is dense, about 11.5 cm. long by 13 mm. in diameter, with the lobes scarcely noticeable except at the very base. The setae are quite visible in the photograph, decidedly exceeding the spikelets and the fragment sent me shows them to be green and more than twice the length of the spikelet. The fruit is quite immature, but unquestionably belongs in the straw-colored group. These characters enable me to identify the form as that named *Panicum italicum* var. *praecox* by Alefeld, Landw. Fl. 315 (1866) and taken up by Körnicke in Körn. & Wern. Handb. Getreideb. 1: 276 (1885) which I have classed as subvar. *germanica*.

Early in the study of the subject I realized that a second form of the species was causing some of the confusion as some authors referred back to *Panicum germanicum* Mill., others to *P. germanicum* Willd. Willdenow, Sp. Pl. 1: 336 (1797), described a plant as *P. germanicum*, "P. spica composita coarctata, spiculis glomeratis, involucellis setaceis flore longioribus, rachi hirsuta." As will be noticed, at once, the setae are described as longer than the spikelets as opposed to the variety  $\beta$  "involucellis flore brevioribus." Also the fact that the spike is described as composite should be noted. Willdenow refers to Roth, Tent. Fl. Germ., but his description clashes with Roth's in the length of the setae. Through the courtesy of Prof. Engler, Dr. Pilger wrote me as follows about the Willdenow Herbarium specimen "Was im Herbarium Willdenow unter *Panicum germanicum* liegt ist eine kräftige Form von *Setaria italica*. Obere Halmblätter (die letzten unter der Rispe) 20 cm. und darüber lang, 15–17 mm. breit. Rispe 13 cm. lang, im oberen Teil sehr dicht, 1½ cm. in Durchmesser, an der Basis locker unterbrochen. Spelzen und Granen ± braunlich violett gefärbt. Granen ziemlich kurz. Deckspelze oval, glänzend, grünlich-gelb, fast garnicht gerunzelt, nur hier und da schwache Runzelung." At a later date Dr. Pilger sent me a few spikelets of the Willdenow material which have purplish setae noticeably longer than the spikelets, and have straw-colored fruit. These facts place *P. germanicum* Willd. in the form called *P. italicum* var. *macrochaetum* by Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 273 (1885) which I have renamed var. *Hoslii* as Körnicke derived his name from *Pennisetum macrochaetum* Jacq. Eclog. Gram. 3: t. 25 (1815–20), a species pictured and described as having green setae: *P. macrochaetum* Jacq. is referable to subvar. *germanica*.

Besides the two above mentioned there are other applications of the name *germanica* and a chronological table of some of these uses may be of interest.

(1768) Miller, Gard. Dict., ed. 8, nō. 1 (1768) previously discussed.

(1788) Roth, Tent. Fl. Germ. 1: 27 (1788); 2: 71 (1789) as *Panicum germanicum*. A comparison with *P. italicum* is given in volume two and four points of difference noted: of these, "3 Spiculis conglobatis nec elongatis. 4 Involucellis floribus brevioribus: nec triplo longioribus." The exact form is indeterminable, one of the short-setae variations of *Setaria italica*.

(1797) Willdenow, Sp. Pl. 1: 336 (1797), previously discussed.

(1802) Koeler, Descr. Gram. 16 (1802) as *Panicum italicum* Var. 1 *Germanicum*. The main point of his description is "setis spiculas non superantibus." I cannot place this further than to say it is a form of the *Moharium* group with very short setae.

(1802) Host, Ic. Gram. Austr. 2: 12, t. 15 (1802) as *Panicum germanicum*. The description covers the plate which is of a plant of the *Moharium* group—dense paniced—with rather long purple setae and straw-colored fruit and is readily determined as subvar. *Metzgeri*. The description is broad enough to include other forms.

(1805) Lamarck, in Lam. & DC. Fl. Fr. ed. 3, 3: 14 (1805) as *Panicum italicum* β *Germanicum*. Lamarck says "... les fleurs sont entourées de barbes très-coutres dans le variété β, . . . ." The form is not determinable, but more stress is laid on the length of the setae than on the size or shape of panicle. Probably a form of the lobed group with short setae.

(1812) Beauvois, Agrost. 51, 169, 178 (1812) as *Setaria germanica*. Transfer of name, only, based on *Panicum germanicum* Willd. cf. p. 169. I prefer to leave the form unstated though as far as the name is concerned it would belong under var. *Hostii*.

(1817) Roemer and Schultes, Syst. Veg. 2: 492 (1817) as *Setaria germanica*. The description is copied from Willd. Sp. Pl., but their remarks lead me to believe they had one of the other variations, which one I cannot decide.

(1827) Link, Hort. Berol. 1: 219 (1827) as *Setaria germanica*. Part of the description reads "Setae sursum scabrae spiculis 6–8 plo longiores interdum brevissimae aut deficientes" showing that he had several variants.

(1829) Trinius, Spec. Gram. 2: t. 199 (1829) as *Panicum italicum*

var. *germanicum*. The plate shows a long, slender, cylindrical panicle with long setae. The form is indeterminable, but of the *Moharium* group or quite possibly a variation of *S. viridis* as suggested by the cup-like receptacles shown in one of the detail drawings.

(1829) Eaton, Man., ed. 5, 322 (1829) as *Pennisetum germanicum* based on *Panicum germanicum* Willd. What Eaton really had is difficult to say without seeing his specimen, but it certainly is not var. *Hostii* to which the Willdenow reference is referable as Eaton's description reads "spike compound compact: spikelets glomerate: rachis hirsute: bristles short."

(1838) Schrader, in Linnaea 12: 430 (1838) as *Setaria italica*  $\beta$  *germanica*. Based on *Panicum germanicum* Roth, a form with short setae which I cannot place. The other references given are Host Gram. 2: t. 17 [probably should be 15] which equals subvar. *Metzgeri* and Trin. Icon. t. [probably 199 is meant] which as before stated is indeterminable. There is no description given.

(1816-46) Baumgarten, Enum. Stirp. Magno. Transs. 3: 277 (1816-46). References to the same page of this work are given for *Paspalum germanicum* and *Pennisetum germanicum*. I have not seen the work and do not know which one is correct or if both combinations are given nor have I any idea to what form the citation is referable.

(1847) Wood, Class-book Bot., ed. 2, 607 (1847) as *Setaria germanica*. There is nothing in the description to determine what form it applies to. The other editions of Wood are practically the same.

(1848) Parlatore, Fl. Ital. 1: 114 (1848) as *Setaria germanica*. There is nothing to determine the form.

(1853) Ledebour, Fl. Ross. 4: 471 (1853) as *Setaria italica*  $\beta$  *germanica*. All that can be gathered from the description and synonymy is that it treats of a form with the setae shorter than the spikelets.

(1877) Doell, in Mart. Fl. Bras. 2<sup>o</sup>: 165 (1877) as *Panicum italicum* var. *germanicum*. Based on *P. germanicum* Willd., but the other citations refer to other forms. The description commences "Setae longiores . . ." so that he certainly had a long-setaed form.

(1890) Richter, Pl. Eur. 1: 28 (1890) as *Setaria italica*  $\beta$  *germanica*. Only a transfer of name based on *Panicum germanicum* Willd. and consequently referable to var. *Hostii*.

(1890) Beck, Fl. Nieder-Oesterr. 1: 46 (1890) as *Setaria italica*

α) *germanica*. Based on *Panicum germanicum* Willd. and hence referable to var. *Hostii* as to name and probably as to description. Exclude the synonym *P. italica* var. *brevisetum* Doell which is another form.

(1891) Kuntze, Rev. Gen. Pl. 2: 767 (1891) as *Chamaeraphis italica* δ *germanica*. The synonymy given is *Panicum germanicum* L. non Roth; *P. maritimum* Lam. To what Kuntze refers as *P. germanicum* L. I am not certain as the following is the nearest approach to such a combination that I can find in Linnaeus' works and the only reference given, in Linnaeus Codex. Linnaeus, Mant. 2: 323 (1771) "*italicum*. *Panicum germanicum* multo minus est, spica ovata, nec elongata." This is in the section of the Mantissa headed Observationes in Species Plantarum cum Emendationibus et Animadversionibus, and is certainly only a comment on the German form of *S. italica*. *Panicum maritimum* Lam. is indeterminable as to form.

(1897) Scribner, U. S. Div. Agrost. Bull. 6: 32 (1897) as *Chaetochloa italica germanica*. Transfer, only, based on *Panicum germanicum* Mill. and consequently referable to subvar. *germanica*.

(1899) Ascherson and Graebner, Syn. Mitteleur. Fl. 2<sup>1</sup>: 77 (1899) as *Panicum viride* [subsp.] B. *P. italicum* B. *germanicum*. This refers to some form that has the setae a little longer than the spikelets.

(1900) Scribner and Merrill, U. S. Div. Agrost. Bull. 21: 21 (1900) as *Chaetochloa italica germanica*. This is based on *Panicum germanicum* Mill. and is referable to subvar. *germanica* as to name and possibly to subvar. *Metzgeri* as to plant.

(1902) Hitchcock, in Bail. Cycl. Am. Hort. 4: 1662 (1902) as *Setaria italica* var. *germanica*. Based on *Panicum germanicum* Mill., but the authority given for the combination is Richter who based his combination on *P. germanicum* Willd. which is a different form. Prof. Hitchcock describes the plant as follows: "A smaller form more nearly approaching the wild *S. viridis*: bristles much longer than the spikelets which would apply to subvar. *germanica* very well."

(1906) Dalla Torre and Sarntheim, Fl. Tirol. 6<sup>1</sup>: 158 (1906) as *Panicum italicum* stirps *germanica*. Based on *P. germanicum* Mill. and referable to subvar. *germanica* [exclude synonym *Setaria germanica* Beauv. which is uncertain as to form, cf. (1812) Beauvois].

(1908) Hitchcock, in Gray Man., ed. 7, 119 (1908) as *Setaria italica* var. *germanica*. For discussion see (1902) Hitchcock. The description and form referred to are not the same as in the Cyclopaedia as

Prof. Hitchcock in the Manual describes the variety as follows, "GOLDEN-WONDER MILLET, which is more slender and has bristles shorter than the spikelets." This description would apply to several of the variations mentioned in this paper. The common name Golden Wonder Millet applies to forma *brevisetata*, a very large, lobulate-panicled form.

## KEY TO SPECIES TREATED.

- a.* Setae retrorsely barbed. *S. verticillata*
- a.* Setae antrorsely barbed. *b.*
  - b.* Spikelet articulate below the glumes; complete spikelet shells out leaving a cup-like receptacle. *S. viridis* and varieties
  - b.* Spikelet articulate above the glumes; fruit only shells out leaving the glumes and sterile lemma behind. *S. italica* and variations

SETARIA VERTICILLATA (L.) Beauv. Agrost. 51, 171, 178 (1812). I have not attempted to go into the involved synonymy of this species as it is readily distinguished from *S. viridis* var. *ambigua*,—which it otherwise resembles,—by the retrorsely barbed setae. From the material I have seen I am inclined to agree with Sir. J. D. Hooker, Fl. Brit. Ind. 7: 80 (1896) in considering *S. Rottleri* Spreng. synonymous.

RANGE.—Sparingly introduced in Canada, in the United States, mainly eastwards, in Mexico and Central America. In Venezuela? and Brazil fide Doell. Common in Europe, occurring in several sections of Africa, in Asia Minor, British India, Philippines, Australia and Hawaii.

SETARIA VIRIDIS (L.) Beauv. Agrost. 51, 171, 178, t. 13, f. 3 (1812): R. & S. Syst. Veg. 2: 488 (1817): Link, Hort. Berol. 1: 218 (1827): Kunth, Rev. Gram. 1: 46 (1829) [excl. syn. in part]: Reichb. Fl. Germ. Excurs. 1: 29 (1830): Kunth, Enum. Pl. 1: 151 (1833) [excl.  $\beta$  which refers to var. Weinmanni]: Reichb. Ic. Fl. Germ. 1: 68, t. 47 [188] (1834); ed. 2, l. c. (1850): Koch, Syn. Fl. Germ., ed. 1, 773 (1837) [excl. portion referring to *S. Weinmanni*]: Parl. Fl. Ital. 1: 111 (1848): Gray, Man., ed. 1, 615 (1848); Hitchc. in ed. 7, 118 (1908): Coss. & Dur. Expl. Sci. Alger. 2: 36 (1854): Miq. Fl. Ind. Bat. 3: 467 (1855-60): Griseb. Fl. Brit. W. Ind. 554 (1864): Lowe, Nat. Hist. Brit. Grasses 101, t. 31, f. B (1865): Schur, Enum. Pl. Transs. 723 (1866); ed. nov. l. c. (1885): Syme, in Sowerby, Engl. Bot., ed. 3, 11: 13, t. 1693 (1873) [as to name, descr. and plate questionable]: Benth. Fl. Austral. 7: 494 (1878): Boiss. Fl. Orient. 5: 443 (1884): Hook. f. Fl.



Brit. Ind. 7: 80 (1896): Wildem. & Dur. Prodr. Fl. Belg. 3: 80 (1900), PRELINNAEAN REFERENCES: C. Bauhin, Theatr. Bot. 138, fig. (1658), *Gramen panicum, sive panicum sylvestre simplici spica*: C. Bauhin, Pinax 8 (1671) *Gramen panicum spica simplici* . . . : Scheuchzer, Agrost. 46 (1719) *Gramen panicum, seu panicum sylvestre simplici spica* [the Bauhin reference only]. *Panicum glaucum*  $\beta$  L. Sp. Pl., ed. 1, 1: 56 (1753). *P. viride* L. Syst. Nat.; ed. 10, 2: 870 (1759): Leers, Fl. Herborn. 13, t. 2, f. 2 (1775): Curt. Fl. Lond. fasc. 4: no. 44, t. 262 [also cited as fasc. 4: t. 5] (1782?): All. Fl. Pedem. 2: 240 (1785): Vill. Hist. Pl. Dauph. 2: 64 (1787): Roth, Teut. Fl. Germ. 1: 27 (1788); 2: 69 (1789): Lam. Tabl. Ill. 1: 169 (1791): Hoffm. Deutschl. Fl. 1: 21 (1791): Willd. Sp. Pl. 1: 335 (1797): Lam. Encycl. 4: 727 [err. typ. 737] (1798): Sm. in Engl. Bot. 13: t. 875 (1801) [the plate seems to me to be *Setaria italica*]: Host, Ic. Gram. Austr. 2: 12, t. 14 (1802): Koel. Descr. Gram. 10 (1802): Knapp, Gram. Brit. t. 10 (1804): Schrad. Fl. Germ. 1: 240 (1806): Gaudin, Agrost. Helv. 1: 17 (1811) [excl. syn. Host, Gram. Austr. 2: t. 15]: Hornem. Hort. Hafn. 81 (1813): Eaton, Man., ed. 2, 339 (1818): Mert. & Koch, in Röhl. Deutschl. Fl., ed. 3, 1: 469 (1823): Trin. Gram. Panic. 163 (1826): Gaudin, Fl. Helv. 1: 152 (1828): Trin. Spec. Gram. 2: t. 203 (1829): Bertol. Fl. Ital. 1: 420 (1833) [excl. syn. *P. verticillatum* b *ambiguum* Guss.]: Doell, Fl. Grossherz. Bad. 1: 233 (1857): Lehm. in Arch. Naturk. Livl., ser. 2, 11: 137 [Fl. Poln.-Livl. 137] (1895): Dalla Torre & Sarnth. Fl. Tirol. 6<sup>1</sup>: 156 (1906). *P. laevigatum* Lam. Fl. Fr. 3: 578 (1778). *P. crusgalli* O. F. Müll. non L. in Fl. Dan. 5 fasc. 15: 3, t. 852 (1782) [as to plate, but not as to descr. or syn.]. *P. reclinatum* Vill. Hist. Pl. Dauph. 2: 64 (1787) [this is considered by some authors to be a synonym of var. *Weinmanni*, but I can see no evidence to show that it really is the same]. *P. viride* var. *reclinata* (Vill.) Hoffm. Deutschl. Fl. 1: 21 (1791). "*Panicum, quale Linnaei*?" Krock. Fl. Siles. 1: 88 (1793) [The date may be 1787 cf. Pritzel Thesaurus. It is questionable if Krock intended to make more than a comment, but various authors have treated it as though it were a combination]. *P. bicolor* Moench, Meth. 206 (1794). *Pennisetum viride* R. Br. Prodr. 1: 195 in obs. (1810) by implication only: combination first made by R. & S. Syst. Veg. 2: 489 (1817) in syn.: Nutt. Gen. 1: 55 (1818): Eaton, Man. ed. 4, 389 (1824): Torr. Fl. N. Y. 2: 430 (1843). *Panicum viride* var. *majus* Gaudin, Agrost. Helv. 1: 18 (1811) as " $\beta$  *Panicum viride majus* N.": Gaudin, Fl. Helv. 1: 152 (1828) as

"*β maius*": Lehm. in Arch. Naturk. Livl., ser. 2, 11: 137 [Fl. Poln.-Livl. 137] (1895) as "Var. *b major* Koch" [Koch did not make the combination]: Dalla Torre & Sarnth. Fl. Tirol. 6<sup>1</sup>: 157 (1906). *Setaria villosa* Beauv. Agrost. 51, 171, 178 (1812) fide Hook. f. Fl. Brit. Ind. *S. nana* Dum. Obs. Gram. Belg. 139 (1823) fide Hook. f. l. c. and Aschers. & Graebn. Syn. Mitteleur. Fl. *S. affinis* Schultes, Mant. 2: 276 (1824) questionable synonym fide Hook. f. l. c. *Panicum viride* var. *humifusum* Lej. Rev. Fl. Spa 13 (1824) nomen: Lej. & Court. Comp. Fl. Belg. 1: 52 (1828). *P. humile* Thunb. ex Trin. Gram. Panic. 164 (1826) in syn. sub. *P. viride*. *Setaria viridis* var. *nana* Dum. Florula Belg. 150 (1827): Wildem. & Dur. Prodr. Fl. Belg. 3: 80 (1900). *Panicum viride* var. *nanum* (Dum.) Lej. & Court. Comp. Fl. Belg. 1: 52 (1828). *P. viride* var. *longisetum* Doell, Rhein. Fl. 128 (1843): Doell, Fl. Grossherz. Bad. 1: 234 (1857). *Setaria penicillata* Nees ex Wall. Cat. n. 8640D (1848) nomen, fide Hook. f. Fl. Brit. Ind. *Panicum viridescens* Steud. Syn. Pl. Gram. 51 (1854) fide Miq. Fl. Ind. Bat. *P. muticum* Hort. Lips. ex Steud. l. c. 51 (1854) in syn. sub. *P. viride*. *Setaria viridis* var. *latifolia* Ambr. Fl. Tirol. Merid. 1: 42 (1854). *S. panis* Jessen, Deutschl. Gräser 248, 249, in part, figs. 391, 392 (1863). *S. viridis* var. *nodiflora* Saccardo, in Atti Ist. Ven., ser. 3, 9<sup>2</sup>: 865 (1864). *S. arvensis* subsp. *viridis* (L.) Bruhin, in Bericht. Naturw. St. Gallen 1865-66: 215 (1866): *S. arvensis* subsp. *viridis* var. *fallax* Bruhin, l. c. 1865-56: 215 (1866). *S. chlorantha* Schur, Enum. Pl. Transs. 723 (1866); ed. nov., l. c. (1885) fide Aschers. & Graebn. Syn. Mitteleur. Fl. *Panicum panis* Jessen, in Meyer & Jess. Alberti Magni Veg. 523 in part 1867). *P. viride* var. *vulgare* Doell, in Mart. Fl. Bras. 2<sup>2</sup>: 173 in obs. (1877). *P. viride* var. *gigantea* Franch. & Sav. Enum. Pl. Jap. 2: 162 (1879). *P. italicum* var. *viride* (L.) Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 272, 277 (1885). *Setaria viridis* var. *typica* Beck, Fl. Nieder-Oesterr. 46 (1890). *S. viridis* var. *typica* forma *communis* Beck, l. c. 46 (1890). *S. viridis* var. *typica* forma *major* (Gaud.) Beck, l. c. 46 (1890). ? *S. viridis* var. *secunda* Beck, l. c. 46 (1890). *Chamaeraphis italica* var. *viridis* (L.) Ktze. Rev. Gen. Pl. 2: 767, 768 (1891). *C. viridis* (L.) Millsp. in Bull. W. Va. Agric. Exper. Sta. 2: 466 [Fl. W. Va. 466] (1892): Porter, in Bull. Torr. Bot. Cl. 20: 196 (1893): Beal, Grasses No. Am. 2: 157 (1896). ? *S. viridis* var. *insularis* A. Terrac. in Ann. Ist. Bot. Roma 5: 93 (1894): Dur. & Schinz, Conspect. Fl. Afr. 5: 775 (1894). *Ixophorus viridis* (L.) Nash, in Bull. Torr. Bot. Cl. 22: 423 (1895). *Setaria*

*viridis* var. *typica* Posp. Fl. Oesterr. Küstenl. 1: 51 (1897) [an var. *typica* Beck?]. *S. viridis* var. *major* (Gaud.) Posp. l. c. 1: 51 (1897). *Chaetochloa viridis* (L.) Scribn. U. S. Div. Agrost. Bull. 4: 39 (1897): Scribn. & Merr. U. S. Div. Agrost. Bull. 21: 19. f. 8 (1900): Nash, in Britt. Man., ed. 1, 90 (1901); ed. 3, 90 (1907). *Panicum viride* [subsp.] *A. P. eu-viride* Aschers. & Graebn. Syn. Mitteleur. Fl. 2<sup>1</sup>: 76 (1899). *P. viride* [subsp.] *A. P. eu-viride* A. I. a. 1. *majus* (Gaud.) Aschers. & Graebn. l. c. 2<sup>1</sup>: 77 (1899). *P. viride* [subsp.] *A. P. eu-viride* A. I. a. 1. a. *reclinatum* (Vill.) Aschers. & Graebn. l. c. 2<sup>1</sup>: 77 (1899). *P. viride* [subsp.] *A. P. eu-viride* A. I. a. 1. b. *pygmaeum* Aschers. & Graebn. 2<sup>1</sup>: 77 (1899). *P. viride* [subsp.] *A. P. eu-viride* A. I. b. *nodiflorum* (Saccardo) Aschers. & Graebn. l. c. 2<sup>1</sup>: 77 (1899). *Setaria viridis* var. *humifusa* (Lej. & Court.) Wildem. & Dur. Prodr. Fl. Belg. 3: 885 (1903). *Panicum viride* var. *fallax* (Bruhin) Dalla Torre & Sarnth. Fl. Tirol. 6<sup>1</sup>: 157 (1906). *Setaria viridis* subsp. *eu-viridis* (Aschers. & Graebn.) Briq. Prodr. Fl. Corse 1: 68 (1910). *S. italica* subsp. *viridis* (L.) Thell. in Mem. Soc. Sci. Nat. Cherb. 38: 85 (1911). *S. viridis* var. *australis* F. M. Bail. Compr. Cat. Queensl. Pl. 611 (1913).

An extremely variable species frequently approaching *S. italica* or *S. verticillata* in appearance. From the former it may be distinguished by the spikelets being articulate below the glumes and easily shelled out—entire—when nearing maturity, leaving a little cup at the end of the pedicel, whereas *S. italica* is articulate above the glumes and shells out the fruit only. Some few specimens show intermediate characters and point toward hybridity. *S. viridis* is considered by many to be the origin of *S. italica* which may well be the case, but to-day the two seem to be readily separated by the above-stated character. From *S. verticillata* it is at once distinguished by the antrorse barbs of the setae: *S. verticillata* has the setae retrorsely barbed.

There are many forms of the species which in most instances are not clearly differentiated and which pass into each other too thoroughly to seem worthy of nomenclatorial designation. Size of plant, size of panicle, color and length of setae are all variable, but not consistently enough so to separate along these lines. Seed color is usually the same,—when fully mature,—a dull straw-drab with darker mottlings, though immature it ranges from whitish-green through shades of green and yellowish-green to straw.

The plant is usually erect or sometimes slightly geniculate, simple or many branched at the base, 3 to 10 dm. tall [depauperate specimens sometimes 1 dm. or even less], the culms fairly stout. The leaves are commonly fairly broad and long acuminate, 5 to 30 cm. long, 4 to 15 mm. broad. The panicles vary in size and compactness sometimes being somewhat lobulate and interrupted toward the base, but not verticillately so, more or less blunt or tapering at the base and apex, 1 to 15 cm. long<sup>3</sup> [usually relatively thick when short], 4 to 14 mm. in diameter, the rhachis commonly pilose. The spikelets range in size from 1.8 to 2.7 mm. long—most commonly 2.2 to 2.5 mm.,—0.8 to 1.6 mm. broad. The second glume is commonly as long as the sterile lemma, but occasionally is slightly shorter. The setae are variable in length, but usually considerably longer than the spikelets and are ordinarily green or greenish-yellow, but are sometimes purple-tipped or even all dark purple. The fruit is slightly rugulose, generally more so than in *S. italica*.

RANGE.—Occurring pretty generally throughout the United States and Canada, usually near cultivated land. Found sparingly in Mexico and in Brazil—fide Doell. Common throughout Europe, no plants seen from Africa or Asia Minor, but in Asia it occurs in Russia, British India, China, Japan and Formosa.

SETARIA VIRIDIS (L.) Beauv. var. AMBIGUA (Guss.) Coss. in Coss. & Dur. Expl. Sci. Alger. 2: 36 (1854): Boiss. Fl. Orient. 5: 443 (1884): Beck, Fl. Nieder-Oesterr. 46 (1890) [excl. syn. *P. viride* var. *brevisetum* Doell]: Dur. & Schinz, Consp. Fl. Afr. 5: 775 (1894): Halacsy, Consp. Fl. Graec. 3: 333 (1904). *Panicum viride* L. misapplied by Desf. F. Atlant. 1: 58 (1798) [excl. syn.] fide Guss. Fl. Sic. Syn. *P. verticillatum* b *ambiguum* Guss. Fl. Sic. Prodr. 1: 80 (1827). *Setaria ambigua* Guss. Fl. Sic. Syn. 1: 114 (1842): Lojac. Fl. Sic. 3: 266 (1909). *S. verticillata* var. *ambigua* (Guss.) Parl. Fl. Palerm. 1: 36 (1845): Parl. Fl. Ital. 1: 111 (1848): Richter, Pl. Eur. 1: 28 (1890): Brand, in Koch, Syn. Deutsch. Fl., ed. 3, 3: 2689 (1905). *Panicum adhaerens* Subsp. 1 *P. verticillatum antrorsum* A. Br. in Ind. Sem. Hort. Berol. 1871, App.: 7 (1871). ? *Setaria pseudo-verticillata* Hort. ex A. Br. l. c. 1871, App.: 7 (1871) in syn. *S. glomerata* Hort. ex A. Br. l. c. 1871, App.: 7 (1871) in syn. *Panicum ambiguum* (Guss.) Hausskn. in Oesterr. Bot. Zeitschr. 25: 345 (1875): Dalla Torre & Sarnth. Fl.

<sup>3</sup> These small panicles are the secondary ones, the primary panicles are rarely under 5 cm. long.

Tirol. 6<sup>1</sup>: 156 (1906). *P. viride* var. *subverticillatum* Doell, in Mart. Fl. Bras. 2<sup>2</sup>: 173, in obs. (1877). *Setaria decipiens* C. Schimp. ex Nym. Consp. 787 (1842) in syn. sub *S. ambigua*. *Chamaeraphis italica* var. *ambigua* (Guss.) Ktze. Rev. Gen. Pl. 2: 768 (1891). *Panicum verticillatum* B. *ambiguum* (Guss.) Aschers. & Graebn. Syn. Mitteleur. Fl. 2<sup>1</sup>: 75 (1899). *Chaetochloa ambigua* (Guss.) Scribn. & Merr. U. S. Div. Agrost. Bull. 21: 18, f. 7 (1900). *Setaria verticillata* subsp. *ambigua* (Guss.) Briq. Prodr. Fl. Corse 1: 67 (1910). *Panicum verticillatum* var. *antrorsum* A. Br. ex Briq. l. c. 1: 67 (1910) in syn.

Distinguished from the typical form of the species chiefly by the more open, verticillate or subverticillate panicle [especially toward the base] and by the main rhachis being scabrous or hispid on the angles instead of pilose. Setae antrorsely barbed otherwise in habit strongly suggestive of *S. verticillata*. The setae often not much exceeding the spikelets. Fruit commonly greenish.

This form is decidedly intermediate between *S. verticillata* and *S. viridis*, commonly resembling the former in its verticillate or subverticillate panicle [occasionally *S. verticillata* is compact and only distinguishable from *S. viridis* by the retrorse barbs of the setae and quite frequently *S. viridis* is somewhat subverticillate] and the latter in the direction of the barbs of the setae. Of the two characters, the second seems to me to be more stable and of greater specific weight than the form of the panicle which is extremely variable in *S. viridis*, in fact in most of the *Setarias*: consequently I consider this form better treated as a variety of *S. viridis* than as a variety of *S. verticillata*. Good botanists have treated it both ways and still others have considered it to be a separate species as will be noted in the preceding bibliography. I do not find any consistent characters to separate it specifically.

RANGE.—Reported as a ballast plant collected by Scribner at Camden, N. J. (cf. Scribn. & Merr. U. S. Div. Agrost. Bull. 21: 18 (1900)) and specimens seen from Washington, D. C., and Mobile, Ala. The first a weed in the Grass Garden, the second a ballast plant. Frequent in Europe more especially southward and also known from Algeria in Africa.

SETARA VIRIDIS (L.) Beauv. var. WEINMANNI (R. & S.) Brand, in Koch, Syn. Deutsch. Fl., ed. 3, 3: 2690 (1905): Fernald & Wiegand, in Rhodora 12: 133 (1910). *S. Weinmanni* R. & S. Syst. Veg. 2: 490 (1817). *Panicum purpurascens* Opiz, in Flora 5: 266 (1822)

nomen. *Setaria purpurascens* Opiz, Boehm. Gew. 12 (1823) fide Aschers. & Graebn. Syn. Mitteleur. Fl. ? *Panicum viride* var. *brevisetum* Doell,<sup>4</sup> Rhein. Fl. 128 (1843): Doell, Fl. Grossherz. Bad. 1: 234 (1857): Aschers. Fl. Prov. Brandenb. 1: 809 (1864). *Setaria arvensis* subsp. *viridis* var. *purpurascens* Bruhin, in Bericht. Naturw. Ges. St. Gallen 1865-66: 216 (1866) nomen fide Dalla Torre & Sarnth. Fl. Tirol. ? *S. viridis* b *arenosa* Schur, Enum. Pl. Transs. 723 (1866); ed. nov., 723 (1885). *S. viridis* a *laevigata* Schur, l. c. 723 (1866); ed. nov., 723 (1885). *S. viridis* var. *fuscata* Harz. Landw. Samenk. 2: 1260 (1885) fide Beck, Fl. Nieder-Oesterr. ? *Chamaeraphis italica* var. *viridis* forma *purpurascens* Ktze. Rev. Gen. Pl. 2: 767 (1891). *Panicum viride* var. *minor* Koch, ex Lehm. in Arch. Naturk. Livl., ser. 2, 11: 137 [Fl. Poln.-Livl. 137] (1895) [Koch did not make the combination]. ? *P. viride* [subsp.] *A. P. eu-viride* A. II. *brevisetum* (Doell) Aschers. & Graebn. Syn. Mitteleur. Fl. 2<sup>1</sup>: 77 (1899). *P. viride* [subsp.] *A. P. eu-viride* B. *Weinmannii* (R. & S.) Aschers. & Graebn. l. c. 2<sup>1</sup>: 77 (1899). ? *P. viride* [subsp.] *A. P. eu-viride* B. II. *arenosum* (Schur) Aschers. & Graebn. l. c. 2<sup>1</sup>: 77 (1899). *P. viride* var. *Weinmannii* (R. & S.) Dalla Torre & Sarnth. Fl. Tirol. 6<sup>1</sup>: 157 (1906). *P. Weinmannii* "R. & S." according to Dalla Torre & Sarnth. l. c. 6<sup>1</sup>: 157 (1906) in syn. [R. & S. placed the species under *Setaria*]. *Setaria viridis* var. *breviseta* (Doell) Hitchc. in Rhodora 8: 210 (1906): Hitchc. in Gray Man., ed. 7, 119 (1908) [as to plants, possibly not as to name].

Distinguishable from the common form of *S. viridis* chiefly in its spreading habit [base usually geniculate], its narrower leaves, 2 to 6 mm. wide and its smaller more slender panicles 0.7 to 5 cm. long, 3 to 6 mm. broad. The culms are frequently purplish toward the base. The spikelets are commonly smaller than those of the species 2 to 2.3 mm. long with exceptions only 1.6 mm. and up to 2.4 mm. The setae are either purple or green and vary in length from about the length of the spikelet to about 6 mm. long.

The length of the setae is so variable (when longest only about 6 mm.) that it seems undesirable to separate var. *breviseta* (Doell) Hitchc. as the plants so named agree in every other respect except length of setae. Whether Doell's *Panicum viride*  $\beta$  *brevisetum* is the same I am not so certain as the only point brought out by Doell is the length of the setae which might equally well apply to the species proper.

<sup>4</sup> I can find no evidence to prove conclusively whether this is a short-setae variation of the species proper or of var. *Weinmannii*; usage places it with the latter.

For a further discussion of this variety cf. Fernald and Wiegand, in *Rhodora* 12: 133 (1910).

RANGE.—Occurring in northeastern and central Canada, in the United States in New England and Illinois. Frequent in Europe and also found in Russia and in Arabia. Specimens from Alabama, New Mexico, Arizona, Mexico, one from Hungary and several from India seem intermediate between the variety and the species.

Other minor variations of *S. viridis* or perhaps better termed abnormalities are:

A forked form of which I have seen specimens from Missouri, from northern India and from Japan.

A viviparous form to which several names have been given. *Panicum viride* var. *viviparum* Bertol. Fl. Ital. 1: 421 (1833) nomen: Doell, Rhein. Fl. 128 (1843): Lehm. in Arch. Naturk. Livl., ser. 2, 11: 138 [Fl. Poln.-Livl. 138] (1895). *Setaria viridis* var. *vivipara* (Bertol.) Parl. Fl. Ital. 1: 112 (1848) [as "b. *viviparum*"]: Lucas, in Correspondenzbl. Naturf. Ver. Riga, 12: 185 [Repr. 27] (1862). *S. arvensis* subsp. *viridis* var. *vivipara* Bruhin, in Bericht. Naturw. Ges. St. Gallen, 1865-66: 215, 216 (1866) nomen. *Panicum viride* monstr. *vivipara* (Bruhin) Dalla Torre & Saruth. Fl. Tirol. 6: 157 (1906).

The only specimen I have seen is one from Dover, Maine, collected by Fernald in 1896 and this has only one viviparous panicle, the others being normal.

A few specimens show characters or combinations of characters intermediate between *S. viridis* and *S. italica* which point to hybridity: the specimens that I have seen showing this most clearly are: Rochester, New York; Baxter, no. 5—Garret County, Maryland; Donnell Smith in 1879 and Moscow, Idaho; Henderson, no. 2849 all of which are in the U. S. Nat. Herb.

The following combinations have been commonly referred as synonyms to *S. viridis*, but I believe that they are better referable to other species.

*Panicum cynosuroides* Scop. Fl. Carn., ed. 2, 1: 50 (1772) [commonly referred to *S. viridis*, but I believe more correctly a synonym of *S. glauca*: cf. Roth, Tent. Fl. Germ. 2: 70 (1789) sub *P. glaucum*].

*P. geniculatum* Lam. Encycl. 4: 727 [err. typ. 737] (1798): Hornem. Cat. Hort. Hafn. 28 (1807 ?): Willd. Enum. Hort. Berol. 1031 (1809): Hornem. Hort. Hafn. 81 (1813): Doell, in Mart. Fl. Bras. 2<sup>2</sup>: 158 (1877) [probably equals *S. glauca* of which Lamarck says in the original description it is perhaps only a variety].

*Setaria geniculata* (Lam.) R. & S. Syst. Veg. 2: 491 (1817): Kunth, Enum. Pl. 1: 150 (1833) [probably equals *S. glauca*: cf. *P. geniculatum* Lam.].

*Pennisetum geniculatum* (Lam.) Jacq. Eclog. Gram. 3: 37, t. 26 (1815-20) [the plate is an excellent picture of *S. glauca*].

*Panicum tejucense* Nees, ex Trin. Gram. Panic. 162 (1826) in syn. sub *P. glaucum*: Nees, Agrost. Bras. 243 (1829) [equals *S. imberbis* cf. Doell, in Mart. Fl. Bras. 2<sup>2</sup>: 157 (1877)].

*P. dasyurum* Willd. ex Nees, Agrost. Bras. 241 (1829) [probably equals *S. imberbis*].

*Setaria tejucensis* (Nees) Kunth, Enum. Pl. 1: 150 (1833) [equals *S. imberbis*: based on *Panicum tejucense* Nees].

SETARIA ITALICA (L.) Beauv. [sensu amplissimo] Agrost. 51, 170, 178 (1812): R. & S. Syst. Veg. 2: 493 (1817): Spreng. Syst. Veg. 1: 305 (1825): Link, Hort. Berol. 1: 220 (1827): Schultes, Mant. 3, add. 1 ad Cl. III: 598 (1827): Kunth, Rev. Gram. 1: 46 (1829): Reichb. Fl. Germ. Excurs. 29 (1830): Kunth, Enum. Pl. 1: 153 (1833): Wood, Class-book Bot. 439 (1845); ed. 1860, 788 (1861): Gray, Man. 615 (1848); Hitchc. in ed. 7, 119 (1908): Parl. Fl. Ital. 1: 113 (1848): Duthie & Fuller, Field & Gard. Crops N. W. Prov. & Oudh 2: 5, t. 25 (1883) [yellow fruit]: Richter, Pl. Eur. 1: 28 (1890): Hook. f. Fl. Brit. Ind. 7: 78 (1896) [excl. syn. in part]: Hitchc. in Bail. Cycl. Am. Hort. 4: 1662 (1902). PRELINNAEAN REFERENCES: Dodon. Stirp. Hist. Pempt. 4, Lib. 1, p. 498, fig. (1583) *Panici indici spica*: Lobel. Ic. Stirp. Pl. 42, fig. (1591) *Panicum aliud Indicum*. *Panicula vilosa*: Clusius, Rar. Pl. Hist. Lib. 6, p. CCXV (1601) *Panicum vulgare*: Parkins. Theatr. Bot. p. 1139 fig. & p. 1140 text (1640) *Panicum Indicum pannicula villosa*: C. Bauhin, Theatr. Bot. 518, fig. (1658) *Panicum Germanicum sive panicula minore* [mentions variation in color of fruit]: C. Bauhin, Theatr. Bot. 519, fig. (1658) *Panicum Italicum sive panicula maiore* [mentions variation in color of panicle and fruit]: C. Bauhin, Pinax 27 (1671) *Panicum Germanicum sive panicula minore* [mentions color variation in panicle and fruit]: C. Bauhin, Pinax 27 (1681) *Panicum Italicum sive panicula maiore*: Morison, Hist. 3 Sect. 8, p. 188, t. 3, *Panicum* 1 (1715) *Panicum Germanicum sive panicula minore* [mentions color variation in fruit]: Morison, Hist. 3, Sect. 8, p. 188, t. 3, *Panicum* 2 (1715) *Panicum Italicum sive panicula maiore* [mentions color variation in fruit]: L. Hort. Cliff. 26 (1737) *Panicum sativum*: Royen, Prodr. Hort. Lugd.-



Bat. 54 (1740) *Panicum spica composita aristis gluma brevioribus*: L. Hort. Ups. 19 (1748) *Panicum spica composita, aristis flosculo brevioribus*: Rumph. Herb. Amboin. 5: 202, t. 75, f. 2 (1750) *Panicum indicum* [yellow fruit]. The plate shows a panicle with the tip digitate-divided]. *Panicum italicum* L. Sp. Pl. 1: 56 (1753) [excl. syn. Gronov.]: Gouan, Hort. Monsp. 34 (1762): Mill. Gard. Dict., ed. 8, *Panicum* no. 2 (1768) [mentions different colors of fruit]: L. Mant. 2: 323 (1771): Weig. Obs. Bot. 22 (1772): Willd. Sp. Pl. 1: 336 (1797): Lam. Encycl. 4: 728 [err. type 738] (1798) [mentions different colorings of setae]: Koel. Descr. Gram. 16 (1802): Host, Ic. Gram. Austr. 4: 8 in part [excl. t.] (1809): Gaudin, Agrost. Helv. 1: 20 (1811): Mert. and Koch, in Röhl. Deutschl. Fl., ed. 3, 1: 470 (1823): Metzger, Eur. Cereal. 63 (1824) [as a whole]: Trin. Gram. Panic. 164 (1826): Doell, in Mart. Fl. Bras. 2<sup>2</sup>: 165 (1877): Lehm. in Arch. Naturk. Livl., ser. 2, 11: 138 [Fl. Poln.-Livl. 138] (1895). *P. germanicum* Roth, Tent. Fl. Germ. 1: 27 (1788); 2: 71 (1789): Host, Ic. Gram. Austr. 2: 12 in part [excl. t.] (1802). *P. glomeratum* Moench, Meth. 207 (1794). *P. elongatum* Salisb. Prodr. 18 (1796). *P. maritimum* Hort. Par. ex Lam. Encycl. 4: 727 [err. typ. 737] (1798) [possibly belongs under subvar. *Metzgeri*, but I do not know the color of the fruit]. *P. italicum* var. *germinicum* Koel. Descr. Gram. 17 (1802): D.C. in Lam. & D.C. Fl. Fr., ed. 3, 3: 14 (1805) [as  $\beta$  *P. germanicum*]. ? Trin. Spec. Gram. 2: t. 199 (1829): Doell, in Mart. Fl. Bras. 2<sup>2</sup>: 165 (1877). *Pennisetum italicum* (L.) R. Br. Prodr. 1: 195 (1810): Eaton, Man. Bot., ed. 3, 383 (1822); ed. 8, [Eaton & Wright, No. Am. Bot.] 346 (1840). *Setaria germanica* (Willd.) Beauv. Agrost. 51, 169, 178 (1812) [based on *P. germanicum* Willd.]: R. & S. Syst. Veg. 2: 492 (1817): Link, Hort. Berol. 1: 219 (1827): Reichb. Fl. Germ. Excurs. 29 (1830): Parl. Fl. Ital. 1: 114 (1848). *Panicum intermedium* Vahl, ex Hornem. Hort. Hafn. 1: 82 (1813) fide Trin. Gram. Panic. 165 (1826): *P. compactum* Kit. ex Schultes, Oesterr. Fl., ed. 2, 1: 212 (1814) in syn. sub *P. germanicum* var.  $\beta$ . *Echinochloa intermedia* (Vahl) R. & S. Syst. Veg. 2: 477 (1817). *Setaria maritima* (Lam.) R. & S. l. c. 2: 492 (1817). *Panicum sibiricum* Hort. ex R. & S. l. c. 2: 493 (1817) in syn. sub *S. italica*  $\beta$ . *P. setosum* Hort. ex R. & S. l. c. 2: 492 (1817) in syn. sub *S. germanica*  $\beta$  non Sw. *P. aegyptiacum* Hort. ex R. & S. l. c. 2: 493 (1817) in syn. sub *S. italica*. *Pennisetum germanicum* Baumg. Enum. Stirp. Magno Transs. 3: 277 (1816-46) fide Ind. Kew. 2: 458 (1895). *Paspalum germanicum* Baumg. l. c. 3: 277 (1816-46) fide Richter, Pl.

Eur. 1: 28 (1890). *Panicum pumilum* Link, Enum. Hort. Berol. 1: 76 (1821) fide Trin. Gram. Panic. 166 (1826) sub *P. italicum* f). *P. macrochaeton* Link, l. c. 1: 76 (1821) fide Trin. l. c. 165 (1826) sub *P. italicum* d). *P. melifrugum* Hort. ex Mert. & Koch, in Röhl. Deutschl. Fl., ed. 3, 1: 471 (1823) in syn. sub *P. italicum*. *P. asiaticum* Hort. ex Mert. & Koch, l. c. 1: 471 (1823) in syn. sub *P. italicum*. *P. serotinum* Hort. ex Mert. & Koch, l. c. 1: 471 (1823) in syn. sub *P. italicum*. *Setaria macrochaeta* (Link) Schultes, Mant. 2: 274 (1824): Link, Hort. Berol. 1: 218 (1827). *Panicum setaceum* Hort. ex Trin. Gram. Panic. 166 (1826) in syn. sub *P. italicum* f). *P. attenuatum* Hort. ex Trin. l. c. 166 (1826) in syn. sub *P. italicum* f). *Pennisetum germanicum* (Willd.) Eaton, Man. Bot., ed. 5, 322 (1829); ed. 8, [Eaton & Wright, No. Am. Bot.] 346 (1840). *Setaria flavida* Horn. ex Reichb. Fl. Germ. Excurs. 29 (1830) in syn. sub *S. germanica*. *S. violacea* Horn. ex Reichb. l. c. 29 (1830) in syn. sub *S. germanica*. *S. asiatica* Hort. ex Reichb. l. c. 29 (1830) in syn. sub *S. italica*. *S. persica* Hort. ex Reichb. l. c. 29 (1830) in syn. sub *S. italica*. ? *S. globularis* Presl, Rel. Haenk. 1: 314 (1830) fide Kunth, Enum. Pl. 1: 152 (1833) and Hook. f. Fl. Brit. Ind. 7: 78 (1896). *S. melinis* Link, Hort. Berol. 2: 219 (1833). ? *Panicum miliaceum* Blanco, Fl. Filip., ed. 1, 39 (1837) fide Hook. f. l. c. 7: 78 (1896). *Setaria italica*  $\beta$  *germanicum* (Roth) Schrad. in Linnaea 12: 430 (1838). *Panicum vulgare* Wallr. in Linnaea 14: 542 (1840) [based on *P. vulgare* Clus. Rar. Pl. Hist. Lib. 6, p. CCXV (1601)]. ? *P. globulare* (Presl) Steud. Nom., ed. 2, 2: 257 (1841): Steud. Syn. Pl. Gram. 51 (1854). *Setaria italica*  $\beta$  *germanica* (Beauv.) Ledeb. Fl. Ross. 4: 471 (1853). *S. japonica* Pynaert, in Fl. des Serres 14: 7, fig. (1861). *S. panis* Jessen, Deutschl. Gräser 248, 249 ex parte (1863). *Panicum italicum* c) *maritimum* (Lam.) Aschers. Fl. Prov. Brandenb. 1: 809 (1864). *Setaria compacta* Schur, Enum. Pl. Transs. 967 [index] (1866); ed. nov., 967 [index] (1885). *S. germanica* a. *legitima* Schur, l. c. 724 (1866); ed. nov., 724 (1885). *Panicum panis* Jessen, in Meyer & Jess. Alberti Magni Veg. 523 ex parte (1867). *P. italicum* var. *compactum* A. Br. Ind. Sem. Hort. Berol. 1871: 4 (1871) nomen. *P. italicum* var. *japonicum* Hort. Ber. ex A. Br. l. c. 1871: 4 (1871) nomen. *Setaria italica* var. *typica* Beck, Fl. Nieder-Oesterr. 1: 46 (1890). *S. italica* var. *compacta* (Kit.) Beck, l. c. 1: 46 (1890). *Chamaeraphis italica* (L.) Ktze. Rev. Gen. Pl. 2: 767 (1891) in part: Beal, Grasses No. Am. 2: 154 (1896). *C. italica*  $\alpha$  *sativa* Ktze. l. c. 2: 768 (1891). *C. italica*  $\beta$  *elobata* Ktze.

l. c. 2: 768 (1891). *C. italica*  $\delta$  *germanicum* Ktze. l. c. 2: 768 (1891). *Ixophorus italicus* (L.) Nash, in Bull. Torr. Bot. Cl. 22: 423 (1895): Nash, in Britt. & Br. Ill. Fl. 1: 127, f. 283 (1896). *Chaetochloa italica* (L.) Scribn. U. S. Div. Agrost. Bull. 4: 39 (1897): Scribn. & Merr. U. S. Div. Agrost. Bull. 21: 20, f. 9 (1900): Nash, in Britt. Man. 90 (1901); ed. 3, 90 (1907): Nash, in Small, Fl. Southeast. U. S. 107 (1903). *Panicum viride* [subsp.] *B. P. italicum* (L.) Aschers. & Graebn. Syn. Mitteleur. Fl. 21: 77 (1899). *P. viride* [subsp.] *B. P. italicum* *B. germanicum* Aschers. & Graebn. l. c. 21: 78 (1899). *P. viride* [subsp.] *B. P. italicum* *C. maritimum* (Lam.) Aschers. & Graebn. l. c. 21: 78 (1899). *Setaria italica* var. *germanica* "(Mill.) Richter," according to Hitchc. in Bail. Cycl. Am. Hort. 4: 1662 (1902): according to Hitchc. in Gray, Man. ed. 7, 119 (1908) not var. *germanica* of Richter, Pl. Eur. 1: 28 (1890) which is based on *Panicum germanicum* Willd. and equals var. *Hostii*. *S. viridis* subsp. *italica* (L.) Briq. Prodr. Fl. Corse 1: 68 (1910).

NOTA.—The preceding references apply to some form of the species, but cannot be placed with certainty under any given variation.

*S. italica* is an exceedingly variable species which has been under cultivation for many centuries and consequently has developed innumerable strains. The size of the plant varies from well over a meter to only about a decimeter high and the thickness of the culm is equally variable. The leaves range in length from only about 3 cm. up to 50 cm. and in breadth from 5 to 30 mm.; commonly linear-lanceolate and long-acuminate, but occasionally relatively broad and short-acuminate. The panicle is more or less lobulate-compound and interrupted at the base [section *Maximum* of Alefeld, Landw. Fl.] to dense, seemingly spicate [section *Moharium* of Alefeld, l. c.] and ranges in length from 1 to 30 cm. or more and in diameter from 7 to 55 mm. The spikelets vary in size from 2 to 3.2 mm. long, more commonly 2.6 to 3 mm. and are always articulate above the glumes allowing the fruit to be easily shelled out. The second glume is usually slightly shorter than the sterile lemma, sometimes only three fourths as long but occasionally almost as long. The setae vary in color—being green, purple or brown—and in length from shorter than the spikelets to many times their length, but they are always upwardly barbed [sometimes very slightly so]. The fruit is of three main colors—yellowish, reddish or blackish,—but in varying shades. It is more or less rugulose, sometimes almost smooth when it is shiny.

Of the several lines of variation mentioned, seed-color seems to be the most stable; color of setae the next; form and size of panicle in the third degree, but very variable and intergrading; length of setae the fourth and extremely variable, but noticeable in the extremes; whereas size and shape of seed do not seem to offer any line of separation. Along these lines the following variants of the species may be noted, remembering always that distinctions based on form and size of panicle are sure to show numerous intergrades and that length of setae is only applicable in the extreme form.

KEY TO THE VARIANTS OF SETARIA ITALICA.<sup>5</sup>

- a. Fruit yellowish to straw or light brown. b.
  - b. Setae green. c.
    - c. Panicle more or less open lobulate. d.
      - d. Setae noticeably longer than spikelets. subsp. *stramineofructa*.
      - d. Setae shorter than or barely exceeding spikelets. forma *brevisetata*.
    - c. Panicle dense or slightly lobulate at base. e.
      - e. Setae noticeably longer than spikelets. subvar. *germanica*.
      - e. Setae shorter than or barely exceeding spikelets. forma *mitis*.
  - b. Setae purple. f.
    - f. Panicle more or less open lobulate. var. *Hostii*.
    - f. Panicle dense or slightly lobulate at base. g.
      - g. Setae noticeably longer than spikelets. subvar. *Metzgeri*.
      - g. Setae shorter than or barely exceeding spikelets. forma *curtiseta*.
  - b. Setae brown. h.
    - h. Panicle more or less open lobulate. i.
      - i. Setae noticeably longer than spikelets. var. *brunneoseta*.
      - i. Setae shorter than or barely exceeding spikelets. forma *brachychaeta*.
    - h. Panicle dense or slightly lobulate at base. subvar. *densior*.
- a. Fruit reddish or orange. j.
  - j. Setae green. k.
    - k. Panicle more or less open lobulate. l.
      - l. Setae noticeably longer than spikelets. subsp. *rubrofructa*.
      - l. Setae shorter than or barely exceeding spikelets. forma *gigas*.
    - k. Panicle dense or slightly lobulate at base. subvar. *pabularis*.
  - j. Setae purple. m.
    - m. Panicle more or less open lobulate. var. *purpureoseta*.
    - m. Panicle dense or slightly lobulate at base. subvar. *violacea*.
  - j. Setae brown. n.

<sup>5</sup> Attention is called to the fact that *a*, *b* and *j* each occur three times in the following key.

- n.* Panicle more or less open lobulate. *o.*  
*o.* Setae noticeably longer than spikelets. var. *rubra.*  
*o.* Setae shorter than or barely exceeding spikelets. forma *aurantiaca.*  
*n.* Panicle dense or slightly interrupted at base. subvar. *condensa.*  
*a.* Fruit blackish, brownish black or purplish black, with pale yellowish-straw fruits intermingled (these sometimes predominating). *p.*  
*p.* Setae green, panicle more or less lobulate. subsp. *nigrofructa.*  
*p.* Setae purple-brown, panicle dense. var. *atra.*

SETARIA ITALICA (L.) Beauv. subsp. **stramineofructa** nom. nov.  
*Panicum italicum* var. A Metzger, Eur. Cereal. 63, t. 19, f. A (1824).  
 ? *P. italicum* Trin. Spec. Gram. 2: t. 198 (1829). *P. italicum*  
 var. *longisetum* Doell, Rhein. Fl. 128 (1843): Doell, Fl. Grossherz.  
 Bad. 1: 233 (1857): Körnicke, in Körn. & Wern. Handb. Getreideb.  
 1: 273 (1885): Wern. in Körn. & Wern. l. c. 2: 890 (1885). ? *P.*  
*italicum* var. *californicum* Körnicke, Syst. Übers. Cereal. 18 (1873):  
 Körnicke, in Körn. & Wern. l. c. 1: 273 (1885): Wern. in Körn. &  
 Wern. l. c. 2: 891 (1885) [I have not been able to place this variety  
 satisfactorily, I should judge it dealt with specimens intermediate  
 between subsp. *stramineofructa* and subvar. *germanica*]. *P. italicum*  
 var. *lobatum* Körnicke, in Körn. & Wern. l. c. 1: 273 (1885): Wern. in  
 Körn. & Wern. l. c. 2: 890 (1885). *P. macrurum* Hort. ex Körnicke,  
 in Körn. & Wern. l. c. 1: 273 (1885) in syn. sub *P. italicum* var.  
*longisetum*. *P. frumentaceum* Hort. ex Körnicke, in Körn. & Wern.  
 l. c. 1: 273 (1885) in syn. sub *P. italicum* var. *longisetum*. *Setaria*  
*chrysantha* Hort. ex Körnicke, in Körn. & Wern. l. c. 1: 273 (1885)  
 in syn. sub *P. italicum* var. *longisetum*. *P. viride* [subsp.] *B. P.*  
*italicum* A. *longisetum* (Doell) Aschers. & Graebn. Syn. Mitteleur. Fl.  
 21: 78 (1899).

Plant stout, 5 to 11 dm. or more tall, leaves linear-lanceolate, long tapering acuminate, 12 to 50 cm. long, 5 to 30 mm. broad: panicle usually strongly lobed, variable in shape, ellipsoid, cylindrical, or elongate-ovoid, apex blunt or tapering, 10.5 to 30 cm. or more long, 14 to 55 mm. in diameter; lobes variable in size and length up to 3 or 4 cm., sometimes short-pedicelled, base of panicle more or less open-interrupted: setae green, always noticeably longer than the spikelets, up to 12 mm. long: fruit yellowish to light brownish, mature usually straw, more or less rugulose, commonly obscurely so.

This form passes into subvar. *germanica* and many specimens are difficult to place.

RANGE.—Cultivated; specimens probably escapes, seen from Ontario, Canada; from Massachusetts, New York, Michigan and Texas in the United States and from Russia, British India and the Philippines.

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. forma **breviset**a (Doell) comb. nov. *Panicum italicum* var. *brevisetum* Doell, Rhein. Fl. 128 (1843): Doell, Fl. Grossherz. Bad. 1: 233 (1857) [excl. Host reference]: Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 274 (1885): Wern. in Körn. & Wern. l. c. 2: 893 (1885). *P. italicum* var. *inerm*e Doell, in Mart. Fl. Bras. 2<sup>2</sup>: 165 (1877) cf. Körnicke, in Körn. & Wern. l. c. 1: 274 (1885). *P. brevisetum* Doell, in Mart. l. c. 2<sup>2</sup>: 165 (1877) in syn. sub *P. italicum* var. *inerm*e. *P. italicum* var. *brevisetum* subvar. *insigne* Körnicke, in Körn. & Wern. l. c. 1: 274 (1885): Wern. in Körn. & Wern. l. c. 2: 894 (1885). *P. italicum* var. *brevisetum* subvar. *maximum* Körnicke, ex Wern. in Körn. & Wern. l. c. 2: 894 (1885). *Setaria glomerato-spicata* Hort. ex Körnicke, in Körn. & Wern. l. c. 1: 274 (1885) in syn. sub *P. italicum* var. *brevisetum*. *S. italica sibirica* Hort. ex Körnicke, in Körn. & Wern. l. c. 1: 274 (1885) in syn. sub *P. italicum* var. *brevisetum*.

Differs from the subspecies in having the setae shorter than the spikelets or barely exceeding them.

RANGE.—Specimens seen from West Virginia and British India, also cultivated specimens from Massachusetts and Washington, District of Columbia.

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. subvar. **germanica** (Mill.) comb. nov. *Panicum germanicum* Mill. Gard. Dict., ed. 8, *Panicum* no. 1 (1768). *Pennisetum macrochaeton* Jacq. Eclog. Gram. 3: 36, t. 25 (1815–20). *Panicum italicum* Var. B Metzger, Eur. Cereal. 63, t. 19, f. B (1824). *Setaria macrochaeta* (Jacq.) Spreng. Syst. Veg. 1: 305 (1825): Kunth, Enum. Pl. 1: 152 (1833) [as to name and syn.]. *Panicum italicum* var. *praecox* Alef. Landw. Fl. 315 (1866): Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 276, t. 8, f. 41 (1885). *P. italicum* var. *macrochaetum* (Jacq.) A. Br. Ind. Sem. Hort. Berol. 1871: 4 (1871): Doell, in Mart. Fl. Bras. 2<sup>2</sup>: 165 (1877) [as to name, perhaps not as to plant]. *Chaetochloa italica germanica* (Mill.) Scribn. U. S. Div. Agrost. Bull. 6: 32 (1897): Scribn. & Merr. U. S. Div. Agrost. Bull. 21: 21 (1900) [as to name, possibly subvar. *Metzgeri* as to plant]. *Panicum italicum* stirps *germanicum* (Mill.) Dalla Torre & Sarnth. Fl. Tirol. 6<sup>t</sup>: 158 (1906) [as to name, excl. syn. *S. germanica* Beauv.].

Differs from the subspecies as follows,—plant usually more slender and often not so tall; leaves in general shorter and narrower; panicle variable in size, 1.8 to 13 cm. long, 8 to 15 mm. in diameter, dense or very slightly lobulate at the base, occasionally one or two small interrupted lobes, lanceolate-ellipsoid to elongate-cylindrical; setae noticeably longer than the spikelets. The extreme small forms are sometimes only 1 dm. tall and have panicles very closely resembling *S. viridis*.

RANGE.—Commonly cultivated; specimens—escapes or adventitious—seen from various parts of the United States, from Europe, Russia in Asia, British India, China and the Philippines and from Japan.

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. subvar. GERMANICA (Mill.) Hubb. forma **mitis** (Alef.) comb. nov. *Panicum italicum* Var. E Metzger, Eur. Cereal. 64, t. 17, f. B (1824). *P. italicum* var. *mitis* Alef. Landw. Fl. 316 (1866): Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 277, t. 8, f. 42 (1885) [spelling emended var. *mite*]: Wern. in Körn. & Wern. l. c. 2: 898 (1885).

Differs from the subvariety only in having the setae shorter than or barely exceeding the spikelets.

RANGE.—A single specimen from Quebec, Canada, also one from France and one from China.

A somewhat digitately forked form of subsp. *stramineofructa* is described and pictured by Rumphius, Herb. Amboin. 5: 202, t. 75, f. 2 (1750) and is also spoken of by Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 278 (1885). This form is represented by the following specimen from Texas, *Nealley* in 1886 in U. S. Nat. Herb.

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. var. **Hostii** nom. nov. *Panicum italicum* Host, Ic. Gram. Austr. 4: 8 in part, t. 14 (1809) [the text covers much more than this form; the plate is an excellent representation of the form]. *P. germanicum* Willd. Sp. Pl. 1: 336 (1797) fide description of specimen in Willdenow's Herbarium and fragment of the same. *Setaria italica*  $\beta$  *germanica* (Willd.) Ledeb. Fl. Ross. 4: 471 (1853) [as to name]: Richter, Pl. Eur. 1: 28 (1890): Beck, Fl. Nieder-Oesterr. 1: 46 (1890) [excl. syn. var. *brevisetum* Doell]. *Panicum italicum* var. *macrochaetum* Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 273 (1885) [as to plant and descr., not as to syn.].

Differs from the subspecies principally in having purple setae:

rarely only purple-tipped. The leaves are the same as in the subspecies; the panicles are always lobulate, but sometimes more dense than in the subspecies and almost cylindrical, 7.5 to 22 cm. long, 15 to 40 mm. in diameter; the setae are noticeably longer than the spikelets, up to 18 mm. long.

This form passes into subvar. *Metzgeri* and many specimens are difficult to place.

RANGE.—Commonly cultivated. Specimens not strictly cultural seen from eastern and central United States, from Germany, Russia in Asia and from British India.

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. var. HOSTII Hubb. subvar. **Metzgeri** (Körnicker) comb. nov. *Panicum germanicum* Host, Ic. Gram. Austr. 2: 12 in part, t. 15 (1802) [the description covers more than this form, the plate is a perfect representation of the commonest strain of the subvariety]. *P. italicum* var. *Metzgeri* Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 276 (1885): Wern. in Körn. & Wern. l. c. 2: 896 (1885). *Setaria italica* var. *Metzgeri* (Körnicker) Hack. ex Gramina Hungarica Exsiccatae 7: no. 303<sup>6</sup> and in Exsiccatae List published in Magyar Bot. Lapok 10: 462 (1911) nomen.

Differs from var. *Hostii* principally in its shorter, denser panicles [rarely slightly lobulate toward the base] which are often clavate and truncate or sometimes penicillate at the tip and frequently taper at the base owing to empty clusters of setae. Plant commonly not so tall; leaves usually shorter and narrower; panicle 1 to 13 cm. long, 7 to 17 mm. in diameter; setae always noticeably longer than the spikelets, up to 14 mm. long. Certain specimens resemble purple-setaed specimens of *S. viridis*, but are readily distinguished by the free fruit and ordinarily by the larger spikelets.

RANGE.—One of the most commonly cultivated strains and widely escaped in many parts of Canada and the United States. Specimens also seen from Italy, Hungary, Russia in Europe, India and the Philippines.

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. var. HOSTII Hubb. subvar. METZGERI (Körnicker) Hubb. forma **curtiseta** forma nov.

Differt a subvarietate *Metzgeri* setis quam spiculis brevioribus vel vix superantibus.

<sup>6</sup> Prof. Häckel wrote me that the combination was published on the label of this set of exsiccatae and synonymy is given on the printed label.



Differs from subvariety *Metzgeri* in having the setae shorter than barely exceeding the spikelets.

RANGE.—Only specimen see, Italy—Venetia—Patavium (Padova), Fl. Italica Exicc., ser. 2, no. 1002 [Type in Gray herb.].

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. var. **brunneoseta** var. nov.

Differt imprimis a subspecie colore setarum. Setae flavidi-brunneae, longitudine variabiles, ad 17 mm. longae, semper quam spiculis multo longiores. Panicula lobulata, 9–27 cm. longa, 15–30 mm. in diametro. Fructus aliquando fuscostramineus. Spiculae 2–3 mm. longae.

Differs from the subspecies chiefly in the color of the setae which are yellow brown, variable in length, but always noticeably longer than the spikelets, up to 17 mm. long. The panicle is lobulate, 9 to 27 cm. long, 15 to 30 mm. in diameter. Fruit sometimes dark straw. Spikelets 2 to 3 mm. long.

RANGE.—Philippines, Luzon, *Mangubat* in 1906, Bur. Sci. Philipp. no. 1344 [Type in Gray herb.]. I have also seen a specimen from Tennessee, *Robertson* in 1873 and several cultural specimens.

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. var. BRUNNEOSETA Hubb. forma **brachychaeta** forma nov.

Varietate similis sed setae quam spiculis breviores vel eas paullo superantes. Panicula interdum pro longitudine tenuior.

Like the variety, but the setae shorter than or slightly exceeding the spikelets in length,—panicle sometimes relatively more slender.

RANGE.—India—Mont. Khasia, *Hooker & Thomson* [type in Gray herb.] and Formosa—Bankiang, *Henry*, no. 571 are the only specimens of this form I have seen.

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubb. var. BRUNNEOSETA Hubb. subvar. **densior** subvar. nov.

Differt imprimis a varietate panicula densiore compactiore elobata vel paululum ad basin lobata, 4–15 cm. longa, 8–23 mm. in diametro. Folia saepe grandia usque 40 cm. longa, 37 mm. lata. Fructus interdum fusco-stramineus.

Differs from the variety chiefly in the denser more compact panicle which is not lobed or very slightly so at the base, 4 to 15 cm. long, 8 to 23 mm. in diameter. The leaves frequently large up to 40 cm. long, 37 mm. broad. The fruit occasionally dark straw.

RANGE.—Massachusetts—Weston, *Williams* in 1895 [Type in

Gray herb.]. I have also seen specimens from Maine, Louisiana, Russia in Asia and China, besides several cultural specimens.

SETARIA ITALICA (L.) Beauv. subsp. **rubrofructa** nom. nov. *Panicum italicum* var. *erythrospermum* Körnicke, Syst. Übers. Cereal. 19 (1873) [not *P. erythrospermum* Vahl, ex Hornem.]: Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 274 (1885): Wern. in Körn. & Wern. l. c. 2: 892 (1885).

This form according to Körnicke, in Körn. & Wern. l. c. 1: 274 (1885) has a long slender, rather open, lobulate panicle up to 21 cm. long and 16 mm. in diameter; the setae are green and very long; the fruit intensive light red, shiny and is said to be small; the last statement according to Werner, in Körn. & Wern. l. c. 2: 892 (1885).

NOTA.—Körnicke names this form *Panicum italicum* var. *erythrospermum*, but it is inadvisable to take up this name as it is apt to lead to confusion owing to *P. erythrospermum* Vahl, ex Hornem. Hort. Hafn. 1: 82 (1813) which has purple setae and is referable to subvar. *violacea*.

RANGE.—I have seen no specimens; Körnicke says from Botanic Gardens.

SETARIA ITALICA (L.) Beauv. subsp. RUBROFRUCTA Hubb. forma **gigas** (Körnicke) comb. nov. *Panicum italicum* var. *gigas* Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 275 (1885): Wern. in Körn. & Wern. l. c. 2: 896 (1885). *P. frumentaceum* Hort. ex Körnicke, in Körn. & Wern. l. c. 1: 275 (1885) in syn. sub *P. italicum* var. *gigas*.

Körnicke, in Körn. & Wern. l. c. 1: 275 (1885) describes this form as having a very large and thick panicle up to 23 cm. long and 30 mm. in diameter. Setae less numerous and scarcely exerted: green [cf. Key on page 272]. Fruit dark red.

RANGE.—I have seen no specimens; Körnicke says he received it from Hungary as *Panicum frumentaceum* and that this strain was derived from the Austrian East-Indian expedition.

SETARIA ITALICA (L.) Beauv. subsp. RUBROFRUCTA Hubb. subvar. **pubularis** (Alef.) comb. nov. *Panicum italicum* Var. C Metzger, Eur. Cereal. 64 (1824). *P. italicum* var. *pubularis* Alef. Landw. Fl. 315 (1866): Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 276 (1885) [emended spelling var. *pubulare*].

This form is described by Körnicke, in Körn. & Wern. l. c. 1: 276 (1885) as belonging to the *Moharium* group,—that is small, dense-panicled,—having green setae and orange-yellow fruit.

RANGE.—I have seen one cultivated specimen from Europe which

I have tentatively referred to this form; Körnicke says that this form is unknown to him, but that it has been experimentally cultivated in Germany and France.

*SETARIA ITALICA* (L.) Beauv. subsp. *RUBROFRUCTA* Hubb. var. **purpureoseta** var. nov.

Differt a subspecie setis fusco-purpureis. Folia 30 cm. longa, 20 mm. lata. Panicula crebre lobulata ad basin interrupta, 23 cm. longa, 20 mm. in diametro; setae longae, purpureae. Fructus rubro-aurantiacus.

Differs from the subspecies principally in having purple setae. Leaf 30 cm. long, 20 mm. broad. Panicle close-lobulate, base interrupted, 23 cm. long, 20 mm. in diameter. Setae longish, purplish. Fruit red-orange.

RANGE.—India—Himalayan Herbarium *Strachey and Winterbottom*, no. 3 [Type in Gray herb.]. I have also seen cultural specimens in the Economic Collection of the U. S. Bur. Pl. Ind.

*SETARIA ITALICA* (L.) Beauv. subsp. *RUBROFRUCTA* Hubb. var. *PURPUREOSETA* Hubb. subvar. **violacea** (Alef.) comb. nov. *Panicum erythrospermum* Vahl, ex Hornem. Hort. Hafn. 1: 82 (1813): Jacq. Eclog. Gram. 3: t. 24 (1815–20) [setae represented more pink than usual]. *Echinochloa erythrosperma* (Vahl) R. & S. Syst. Veg. 2: 477 (1817). *Pennisetum erythrospermum* (Vahl) Jacq. Eclog. Gram. 3: 34 (1815–20). *Panicum italicum* Var. D Metzger, Eur. Cereal. 64 (1824). *Setaria erythrosperma* (Vahl) Spreng. Syst. Veg. 1: 304 (1825) [excl. syn. *laevigatum*]. *Panicum italicum* var. *violaceum* Alef. Landw. Fl. 316 (1866): Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 276 (1885). *P. italicum* var. *erythrospermum* (Horn.) A. Br. Ind. Sem. Hort. Berol. 1871: 4 (1871).

Panicle dense, often somewhat lobulate and interrupted at the base, but empty; 8 to 13 cm. long, 10 to 15 mm. in diameter. Leaves usually narrower and plant probably more slender and not as tall [specimens examined run from 5 to 8.5 dm. tall]. Setae purple or sometimes only purple-tipped, noticeably longer than the spikelets, but rather short, up to about 7 mm.

RANGE.—The only specimens of this form which I have seen are cultural.

*SETARIA ITALICA* (L.) Beauv. subsp. *RUBROFRUCTA* Hubb. var. **rubra** (Körnicke) comb. nov. *Panicum italicum* var. *rubrum* Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 274 (1885): Wern. in Körn. & Wern. l. c. 2: 892 (1885).

Varies from the subspecies mainly in having brown setae which are short, but at least twice the length of the spikelets about 6 mm. long. Panicle rather slender, lobulate, somewhat loosely so and interrupted at the base, 13 to 17 cm. long, 13 to 15 mm. in diameter. Spikelets small. Fruit orange-brown.

This form undoubtedly passes into subvar. *condensa*.

RANGE.—I have seen specimens from Assam and the Philippines.

SETARIA ITALICA (L.) Beauv. subsp. RUBROFRUCTA Hubb. var. RUBRA (Körnicker) Hubb. forma **aurantiaca** (Körnicker) comb. nov. *Panicum italicum* var. *aurantiacum* Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 275 (1885): Wern. in Körn. & Wern. l. c. 2: 895 (1885). *Setaria persica* Hort., *S. brevifolia* Hort., *Panicum macrurum* Hort., and *P. eriogonum* Hort. all ex Körnicke in Körn. & Wern. l. c. 1: 275 (1885) sub *P. italicum* var. *aurantiacum*.

Setae shorter than or barely exceeding the spikelets; panicles 9 to 10 cm. long, 8 to 10 mm. in diameter, otherwise like the variety.<sup>7</sup>

RANGE.—Only specimen examined, Philippines—Luzon, *Ramos* in 1909, Bur. Sci. Philipp. no. 7842. Körnicke mentions the form from Algeria.

SETARIA ITALICA (L.) Beauv. subsp. RUBROFRUCTA Hubb. var. RUBRA (Körnicker) Hubb. subvar. **condensa** subvar. nov.

Differt a varietate panicula brevior non lobata.

This form differs from the variety in having shorter, dense, not-lobed panicles, with some scattered empty tufts of setae below the dense portion: measurements without these tufts 4.8 to 6.5 cm. long, about 10 mm. in diameter. Plant about 5 dm. tall and rather slender: leaves smaller and narrower. Fruit rather more orange-red than the variety.

RANGE.—Only specimen seen, Assam, *Chatterjee* in 1902<sup>8</sup> [type in Gray herb.].

SETARIA ITALICA (L.) Beauv. subsp. **nigrofructa** nom. nov. *Panicum italicum* var. *nigrum* Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 274 (1885): Wern. in Körn. & Wern. l. c. 2: 893 (1885).

According to Körnicke, in Körn. & Wern. l. c. 1: 274 (1885) this form has thick panicles somewhat shorter and less lobulate than *Panicum italicum* var. *erythrospermum* Körnicke—which is a synonym

<sup>7</sup> Körnicke, in Körn. & Wern. l. c. 1: 275 (1885) gives somewhat larger measurements—panicle up to 17 cm. long, and up to 20 mm. in diameter.

<sup>8</sup> Material of this collection in the U. S. Nat. Herb. is var. *rubra*.

of subsp. *rubrofructa*—; has green setae of medium length; the fruit mottled and violet-black.

RANGE.—I have seen no specimens; Körnicke reports it from Hungary.

SETARIA ITALICA (L.) Beauv. subsp. NIGROFRUCTA Hubb. var. *atra* (Körnicke) comb. nov. *Panicum italicum* var. *atrum* Körnicke, Syst. Übers. Cereal. 19 (1873): Körnicke, in Körn. & Wern. Handb. Getreideb. 1: 277 (1885): Wern. in Körn. & Wern. l. c. 2: 899 (1885).

Setae brownish-purple, noticeably longer than the spikelets, up to 7 to 8 mm. long. Panicles dense, occasionally somewhat lobulate and interrupted at the base, 1.5 to 10 cm. long, 7 to 15 mm. in diameter, frequently with clusters of empty setae below the dense portion of the panicle. Fruit brown-black to black when mature and well developed. [There are always present in larger or smaller proportion less well developed pale-straw colored fruits.]

RANGE.—All the specimens which I have seen are cultural.

The cultural names applied to the various forms of *S. italica*—collectively known as Foxtail Millets—often cover more than one form of the variants. Sometimes no distinction is made in setae color sometimes the density of the panicle is not a factor. Certain strains in cultivation have been given names and frequently these names seem to have been used for more than one strain. For the application of the following cultural names I am indebted to Mr. H. N. Vinall and Mr. M. A. Carleton of the U. S. Dept. of Agriculture.

GERMAN MILLET.—A large lobed form with long setae, green or purple in color, no distinction being made. Applies indiscriminately to subsp. *stramineofructa* and var. *Hostii*. Cf. Carleton, in Bail. Cycl. Am. Agric. 2: 469, f. 695 (1907).

GOLDEN WONDER MILLET.—A large lobed form with setae shorter than or barely exceeding the spikelets. Applies to forma *brevisetata*.

COMMON MILLET.—A compact form with dense spike-like panicles of the *Moharium* group. The setae are long, but no distinction of color is made. Applies indiscriminately to subvar. *germanica* and subvar. *Metzgeri*; probably also to stout-panicked, large-fruited specimens of subvar. *densior*. Cf. Carleton, in Bail. l. c. 2: 469, f. 694 & 470, f. 697 (1907).

AINO MILLET.—Sometimes termed Japanese Millet, a misleading name, as it covers various strains. Commonly a slender lobulate form with brown setae and small fruit, about 2 mm. long, but also used

for slender, small-fruited, compact-panicled specimens. Cultivated by the Ainos of Japan and also occurring in the Philippines. Applies to the slender-panicled, small-fruited specimens of var. *brunneoseta* and to similar specimens of subvar. *densior*. Cf. Carleton, in Bail. l. c. 2: 469, f. 696 (1907).

**TURKESTAN MILLET.**—A robust growing form with lobulate panicles, orange or reddish fruit and purple setae. Similar to Kursk Millet, but much coarser and ripening later. Applies to var. *purpureoseta*.

**KURSK MILLET.**—Sometimes called Russian Millet, but this term seems to have been used also for the Siberian Millet. A form, belonging to the *Moharium* group, with dense or at base slightly lobed panicles, red or orange fruit and long, purplish setae. Said to be the result of breeding selection from Siberian Millet. Applies to subvar. *violacea*.

**SIBERIAN MILLET.**—A form with large, more or less open lobulate panicles, orange or red fruit and long, brown setae. Applies to var. *rubra*, but judging by the figure under the name Red Siberian Millet it has been also used for subvar. *violacea*, cf. Carleton, in Bail. l. c. 2: 469, f. 693 (1907).

**HUNGARIAN MILLET or MOHAR.**—Also called Hungarian Grass. A form, belonging to the *Moharium* group, with dense, spike-like panicles, fruit blackish or brownish-black with pale yellowish-straw fruits intermingled (these sometimes predominating) and long purplish-brown setae. The panicles average smaller than those of the other forms commonly cultivated [a small strain of subvar. *Metzgeri* is apt to be as small]. Applies correctly to var. *atra*, but seems to have been used also for subvar. *Metzgeri*, cf. Carleton, in Bail. 2: 470, f. 698 (1907).

The following combinations have commonly been referred as synonyms to *Setaria italica*, but I believe that they are better referable to other species.

*Panicum indicum* Mill. Gard. Dict., ed. 8, Panicum no. 3 (1768) [cited by Hook. f. Fl. Brit. Ind. 7: 78 (1896) as a synonym of *S. italica*. The Miller description points to *Pennisetum americanum* (L.) Leeke and the Bauhin reference given by Miller is certainly *P. americanum*. Mr. A. B. Rendle writes me that there is no specimen of *Panicum indicum* in the Miller herbarium].

*P. laevigatum* Muhl. Cat. 9 (1813) nomen: Muhl. in Ell. Sk. 1: 112

(1816): Muhl. Descr. Gram. 100 (1817) [I believe this is undoubtedly a form of *S. imberbis*, cf. Scribn. & Merr. U. S. Div. Agrost. Bull. 27: 2 (1900)].

*Setaria rubicunda* Dum. Obs. Gram. Belg. 139 (1823) [this is referred to *S. italica*, but seems better referable to *S. glauca*, cf. Hook. f. Fl. Brit. Ind. 7: 79 (1896)].

*S. multiseta* Dum. l. c. 138 (1823) [referred in synonymy to *S. italica* by Richter, Pl. Eur. 1: 28 (1890), but I believe it is more probably *S. glauca* though "setae . . . deorsum scabrae" does not fit *S. glauca* and does apply to *S. verticillata*].

*Panicum viride* var. *rubicundum* (Dum.) Lej. Rev. Fl. Spa 217 (1824): Lej. & Court. Comp. Fl. Belg. 1: 51 (1828) [cf. *Setaria rubicunda* Dum. on which it is based].

*Setaria viridis* var. *rubicunda* (Dum.) Th. Dur. in Wildem. & Dur. Prodr. Fl. Belg. 3: 80 (1900) [Durand did not publish the variety in Cat. Fl. Liège as he states, in Prodr. Fl. Belg., that he did: cf. *S. rubicunda* Dum.].

*S. viridis* var. *multiseta* (Dum.) Th. Dur. in Wildem. & Dur. Prodr. Fl. Belg. 3: 80 (1900) [Durand did not publish the variety in Cat. Fl. Liège as he states, in Prodr. Fl. Belg., that he did: cf. *S. multiseta* Dum. on which it is based].